編號： 145

國立成功大學 109 學年度碩士班招生考試試題

系　　所：環境工程學系

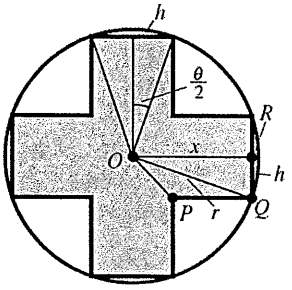
考試科目：微積分

考試日期：0210，節次：3

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. For function $g(x)=\frac{3}{2}\sin\left(\frac{\pi x}{2}-1\right)$ at interval [0, 4]. Find the critical numbers of $g(x)$ and apply the First Derivative Test to identify all relative extrema. (10 points, 10%)

2. Consider a symmetric cross inscribed in a circle of radius r (see figure). Write the area A of the cross as a function of θ and find the value of $\tan\theta$ that maximizes the area. (10 points, 10%)



3. Find a power series for the function $g(x)=\frac{3x-8}{3x^2+5x-2}$ centered at c=0, and determine the interval of convergence. (10 points, 10%)

4. Find the arc length of the graph of the function $y=\frac{1}{6}x^3+\frac{1}{2x}$ over [1, 3]. (10 points, 10%)

5. Write and solve the differential equation that models the rate of change of y with respect to t is proportional to $50-t$. (8 points, 8%)

6. Solve the homogeneous differential equation $(2x+3y)dx-xdy=0$ in terms of x and y. (8 points, 8%)

7. Answer the integration questions. (Total 44 points, 44%)

(1) $\int\frac{\sin x}{7+\cos^2 x}dx$ (5 points)　(2) $\int\frac{e^{1/x^2}}{x^3}dx$ (5 points)　(3) $\int\frac{x}{9-x^4}dx$ (5 points)

(4) $\int_4^{\infty}\frac{\sqrt{x^2-16}}{x^2}dx$ (7 points)　(5) $\int\frac{1}{(u^2\pm a^2)^{3/2}}du$ (8 points)

(6) $\int_0^{\ln 4}\int_0^{\ln 3}e^{x+y}dydx$ (7 points)　(7) $\int_1^4\int_1^{e^2}\int_0^{1/xz}\ln z dydzdx$ (7 points)